ROUTE 7 /287 INTERCHANGE STUDY

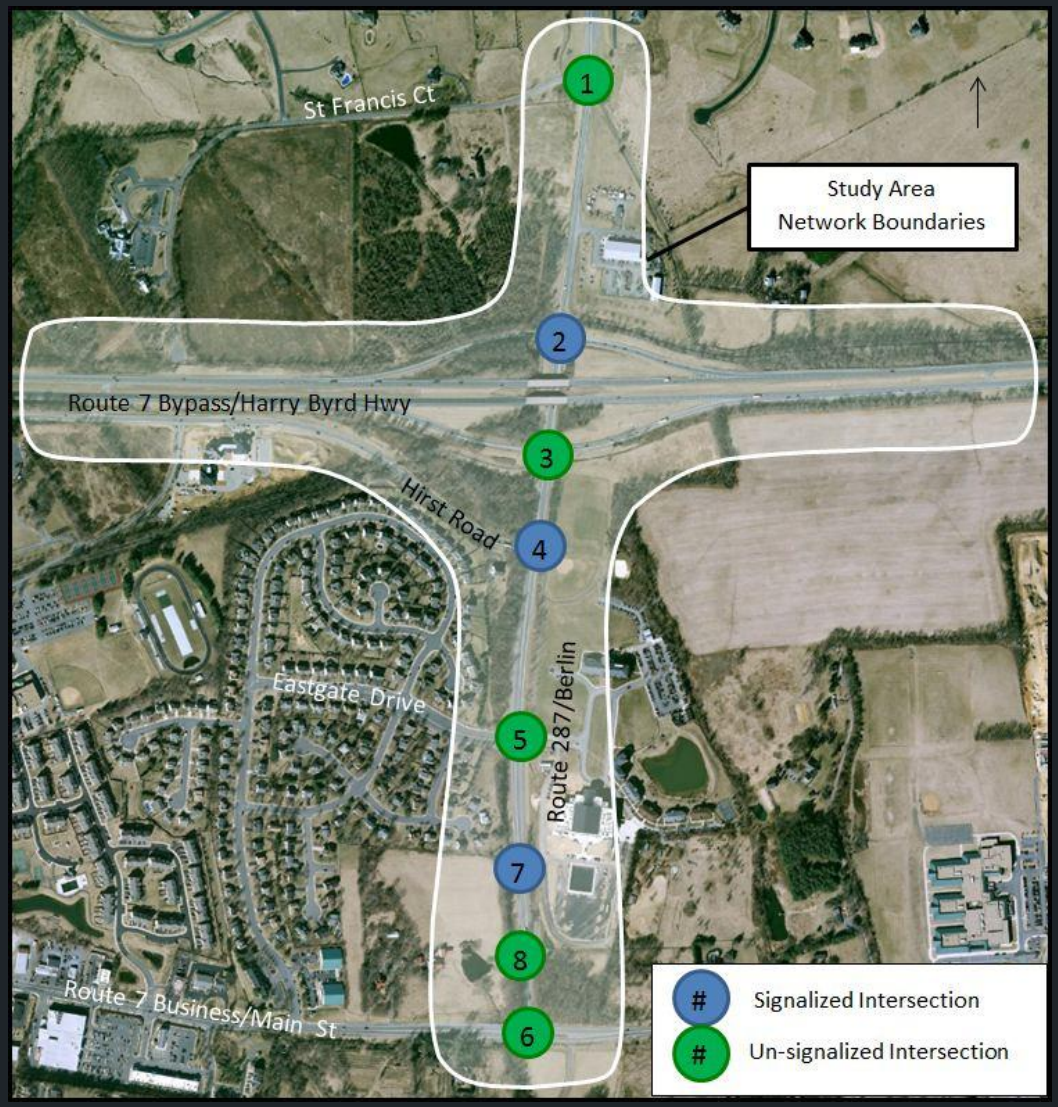
SEPTEMBER 25, 2012

STUDY OBJECTIVES

Analyze current and future traffic conditions in the study area and identify changes to mitigate problems

- Planning level study that focused on traffic flows and general roadway designs.
- Study Advisory Team included staff from Town of Purcellville and Loudoun County as well as VDOT NoVA District.

STUDY AREA

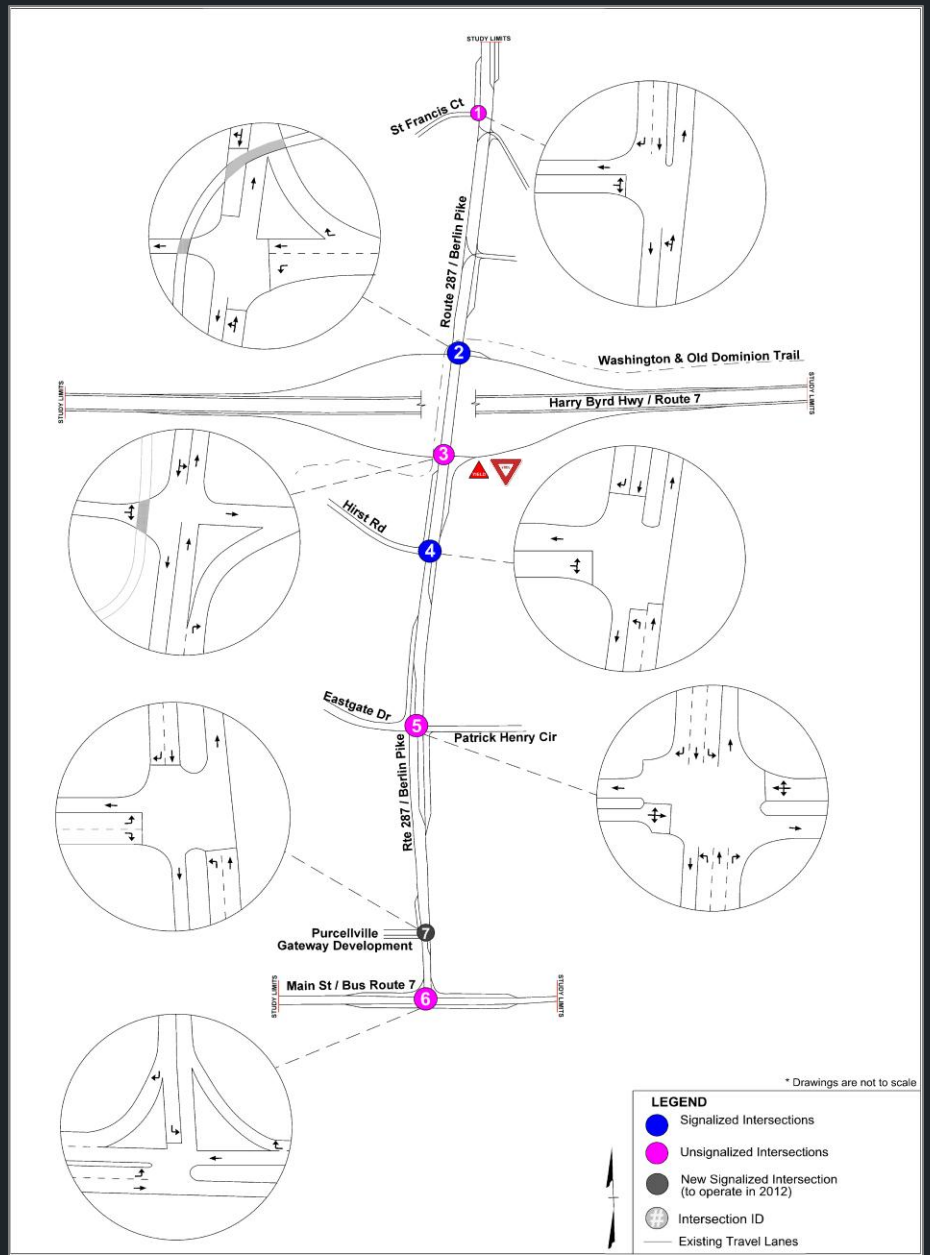

St Francis Ct
Study Area
Network Boundaries
Route 7 Bypass/Harry Byrd Hwy
Hirst Road
Eastgate Drive
Route 287/Berlin
Route 7 Business/Main St
1
2
3
4
5
6
7
8
Signalized Intersection
Un-signalized Intersection

STUDY METHODOLOGY

Analyze traffic conditions in the study area

- Existing Conditions (2011)
- Baseline 2014 Conditions
- 2014 with Improvements
- Baseline 2020 Conditions
- 2020 with Improvements
- Off ramp Westbound at Rt 690

EXISTING CONDITIONS GEOMETRY (DECEMBER 2011)



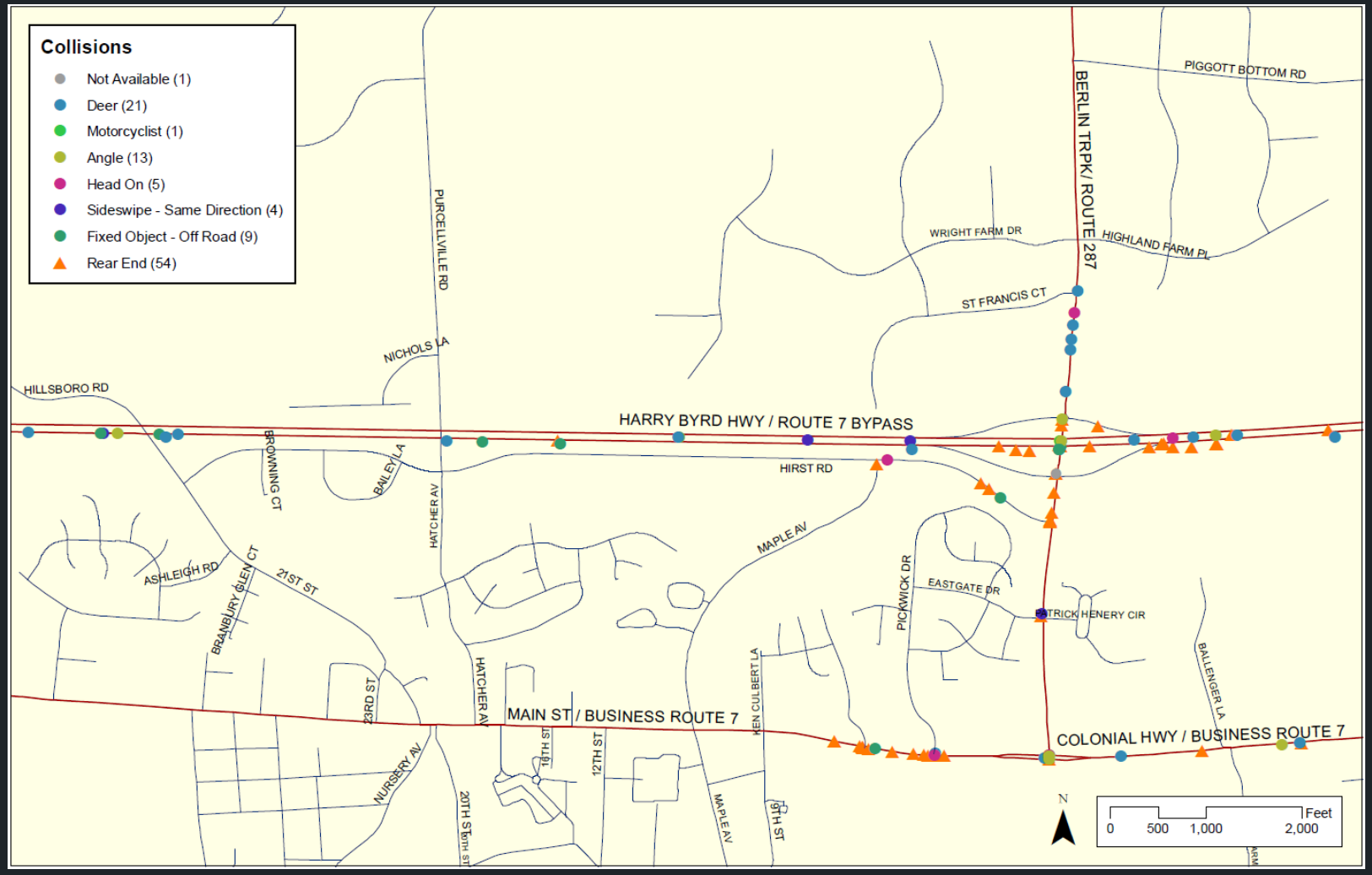
VDOT Virginia Department of Transportation

HNTB

EXISTING OPERATIONAL CONDITIONS

- AM Peak Hour
  - Rt 7 Bypass mainline functions at Level of Service (LOS) C or better
  - All intersection approaches are LOS D or better except East Bound (EB) Hirst RD approach to Rt 287 which is LOS F
- PM Peak Hour
  - Rt 7 Bypass at West Bound (WB) ramp entrance and upstream (eastern) basic segment operate at LOS F, others C or better. Queues on ramp exceed storage, back up onto Rt 7
  - All intersection approaches perform at LOS D or better except EB Hirst Rd at Rt 287 at LOS E

SAFETY


Collisions
Not Available (1)
Deer (21)
Motorcyclist (1)
Angle (13)
Head On (5)
Sideswipe - Same Direction (4)
Fixed Object - Off Road (9)
Rear End (54)
PIGGOTT BOTTOM RD
BERLIN TRPK/ ROUTE 287
WRIGHT FARM DR
HIGHLAND FARM PL
ST FRANCIS CT
PURCELLVILLE RD
NICHOLS LA
HILLSBORO RD
HARRY BYRD HWY / ROUTE 7 BYPASS
HIRST RD
BROWNING CT
BAILEY LA
HATCHER AV
MAPLE AV
ASHLEIGH RD
BRANBURY GLEN CT
21ST ST
PICKWICK DR
EASTGATE DR
PATRICK HENERY CIR
BALLENGER LA
23RD ST
MAIN ST / BUSINESS ROUTE 7
KEN CULBERT LA
COLONIAL HWY / BUSINESS ROUTE 7
NURSERY AV
20TH ST
19TH ST
18TH ST
12TH ST
N
0 500 1,000 2,000 Feet

SAFETY

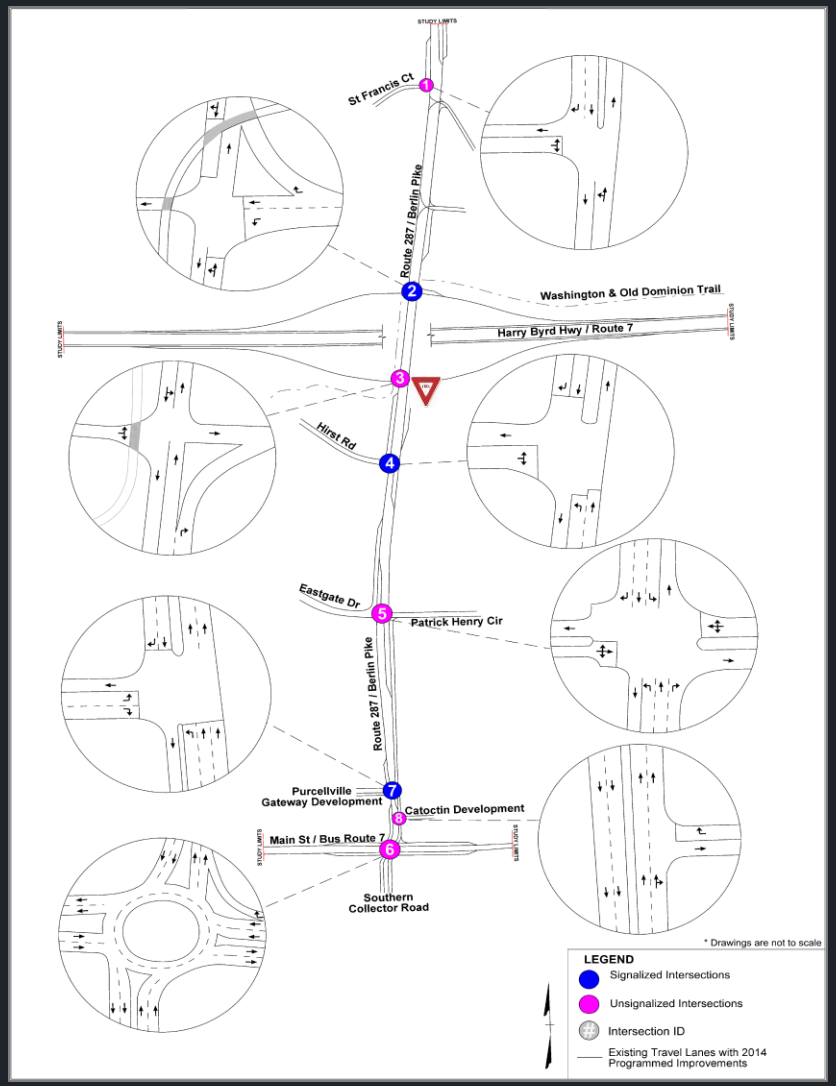
4 Years: 2008-2011

Total- 108 Crashes

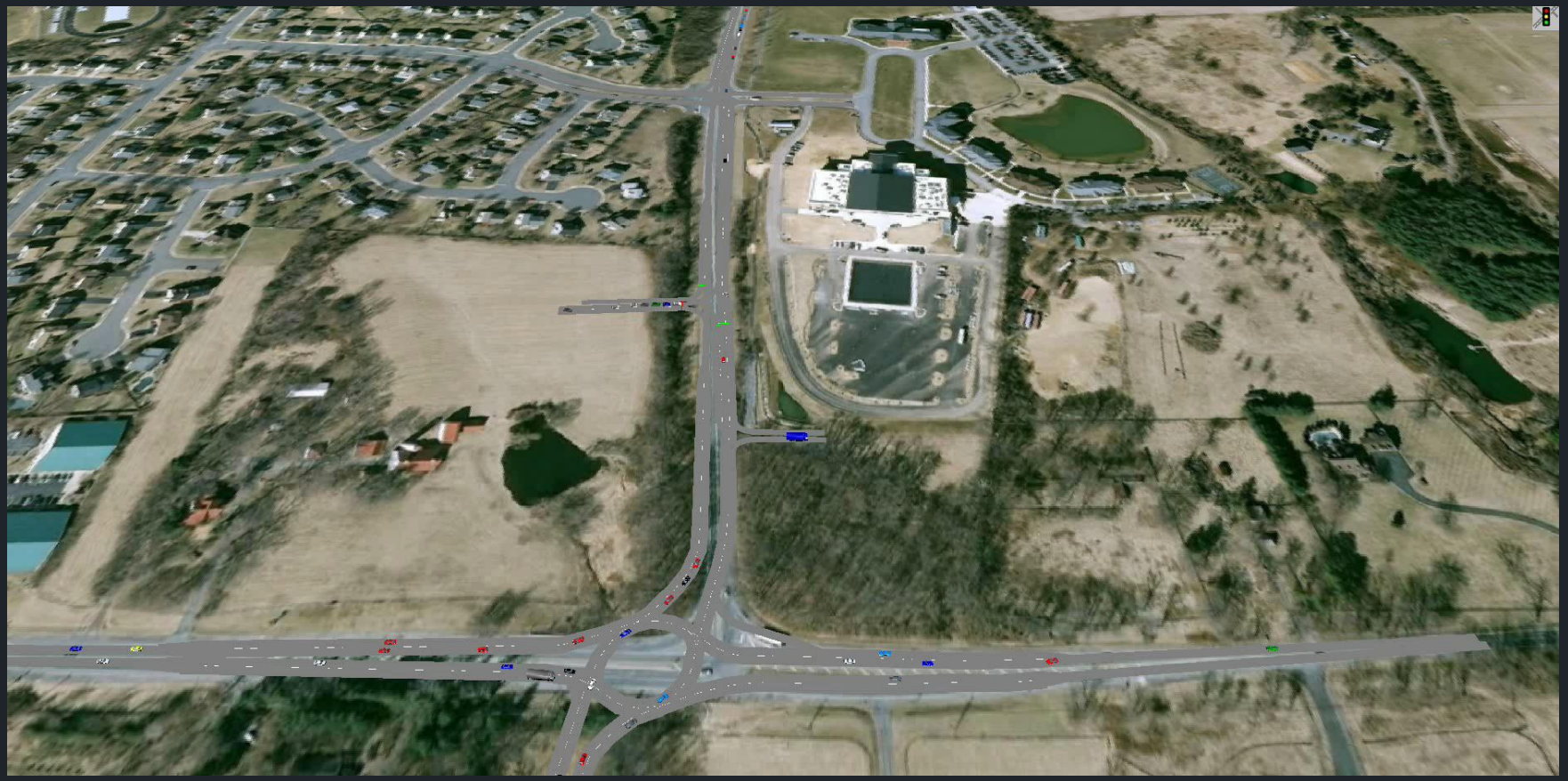
- 50% Rear-end crashes
- 16 Rear-end crashes between 9th St and Pickwick Dr on Rt 7 Business (outside study area)
- Rt 287
  - North of interchange: Deer related
  - At the interchange: Rear-end
- Rt 7 Bypass (Direction not collected) – Majority Rear-end

2014 BASELINE GEOMETRY AND DEVELOPMENT

- Includes changes programmed or underway
- Two-lane roundabout (to be operated as 1- lane until traffic warrants 2)
- Approved development in stages
- New signal operating at Gateway Development (#7 in graphic)



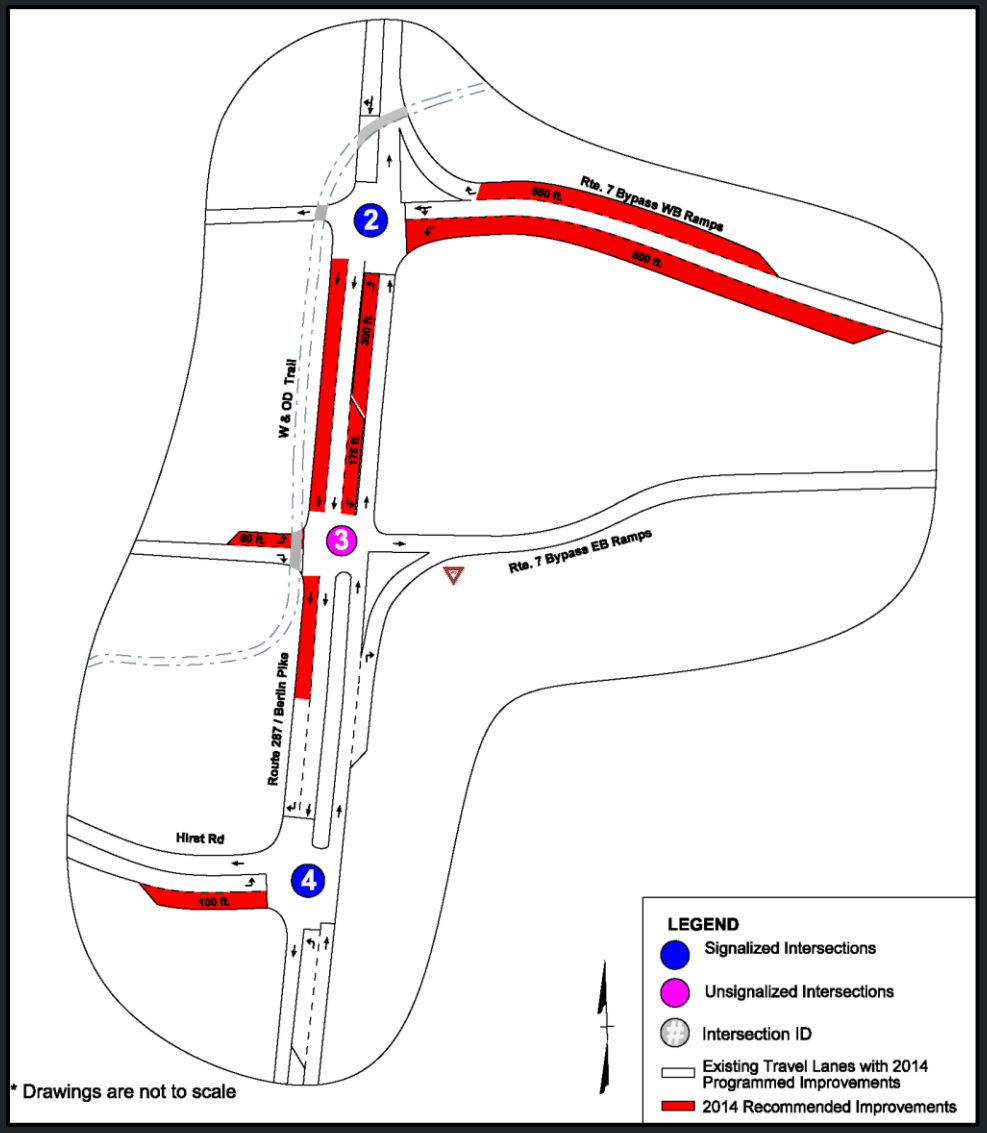
VIDEOS: 2014 BASELINE PM



2014 BASELINE OPERATIONAL ISSUES

- WB Rt 7 Bypass Ramps and Rt 287
  - **Problem**: Queues exceeding length of WB off-ramp and long delays – PM only
  - **Problem**: Northbound Rt 287 queues extend up to Hirst Rd – PM only
- EB Rt 7 Bypass Ramps and Rt 287
  - **Problem:** Long queues and delays on EB off-ramp – PM only
- Hirst Road and Rt 287
  - **Problem:** Long delays and queues on EB approach (Hirst Rd) – AM and PM

2014 IMPROVED GEOMETRY



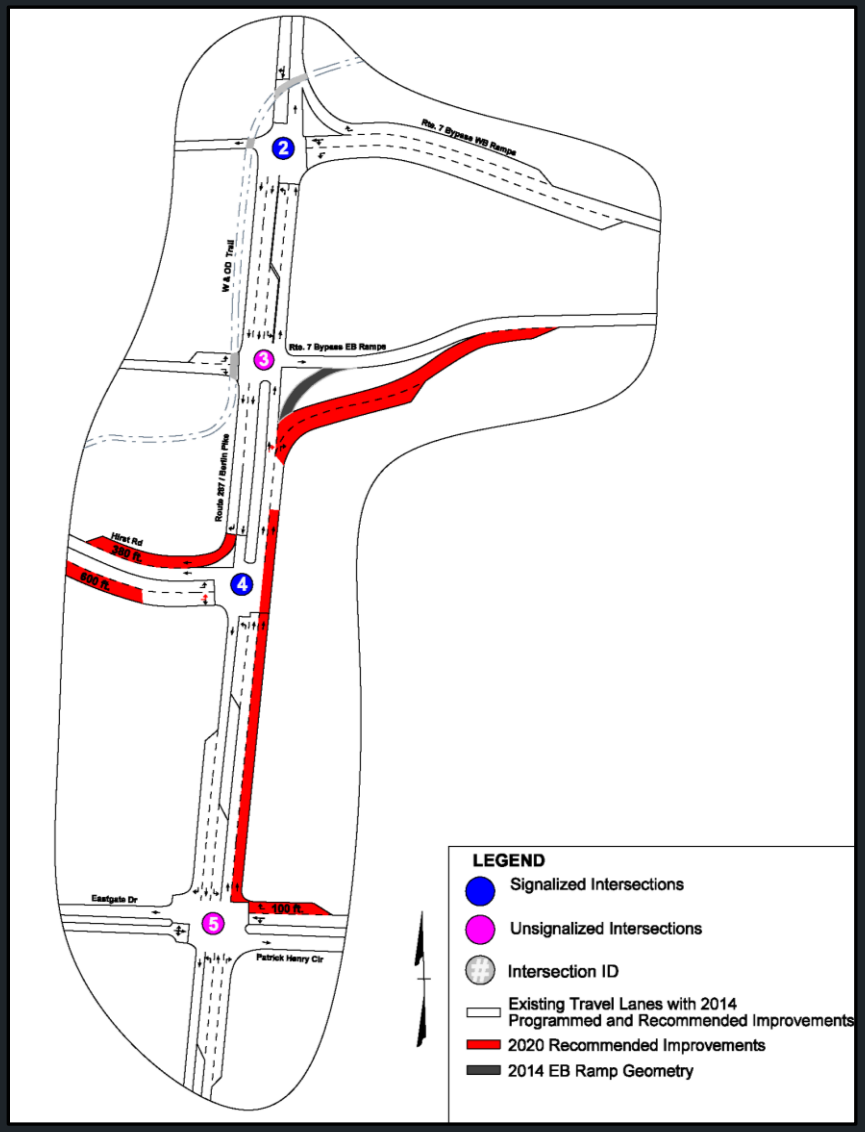
2014 IMPROVED NETWORK RESULTS

- AM Peak Hour
  - Rt 7 Bypass at LOS C or better except for the EB segment after the on-ramp, which is at LOS D
  - The Hirst Rd EB approach at Rt 287 operates at LOS D, due to the geometric improvements, with delays reduced
- PM Peak Hour
  - WB diverge and the eastern basic segment operate at LOS C
  - Rt 287/Rt 7 Bypass WB Ramps operates at LOS C, queues within storage
  - Hirst Rt EB approach at Rt 287 improves to LOS E with significantly reduced delays

2020 BASELINE OPERATIONAL ISSUES

- Rt 287 & Hirst Road
  - **Problem:** Long delays and queues on EB approach during AM and PM Peak Hours
- Rt 287 & Eastgate Drive/Patrick Henry Circle
  - **Problem:** Long queues and delays on Patrick Henry Cir. WB during AM and PM Peak Hours
- Rt 7 WB ramp
  - Functions well due to 2014 Improvements which are included

2020 IMPROVED SCHEMATIC GEOMETRY



2020 IMPROVEMENTS

- At Rt 7 Bypass EB on-ramp and Rt 287
  - Widen and extend the EB on-ramp merge area to accommodate a second North bound right (NBR) turn lane
  - Extend NBR turn bay to Hirst Road providing a full lane
- At Hirst Rd and Rt 287
  - Add a WB receiving lane with 380 feet of acceleration length
  - Extend the EBR turn lane to 600 feet of storage length and convert it to a shared Left and Right
  - Add a NBThru lane and extend it to Eastgate Dr / Patrick Henry Cir.
- At Patrick Henry Cir. and Rt 287
  - Add a WBR turn lane with 100 feet of storage length

2020 IMPROVED NETWORK RESULTS

In AM Peak, all segments of Rt 7 Bypass are at LOS C or better except for east of the on-ramp at LOS D.

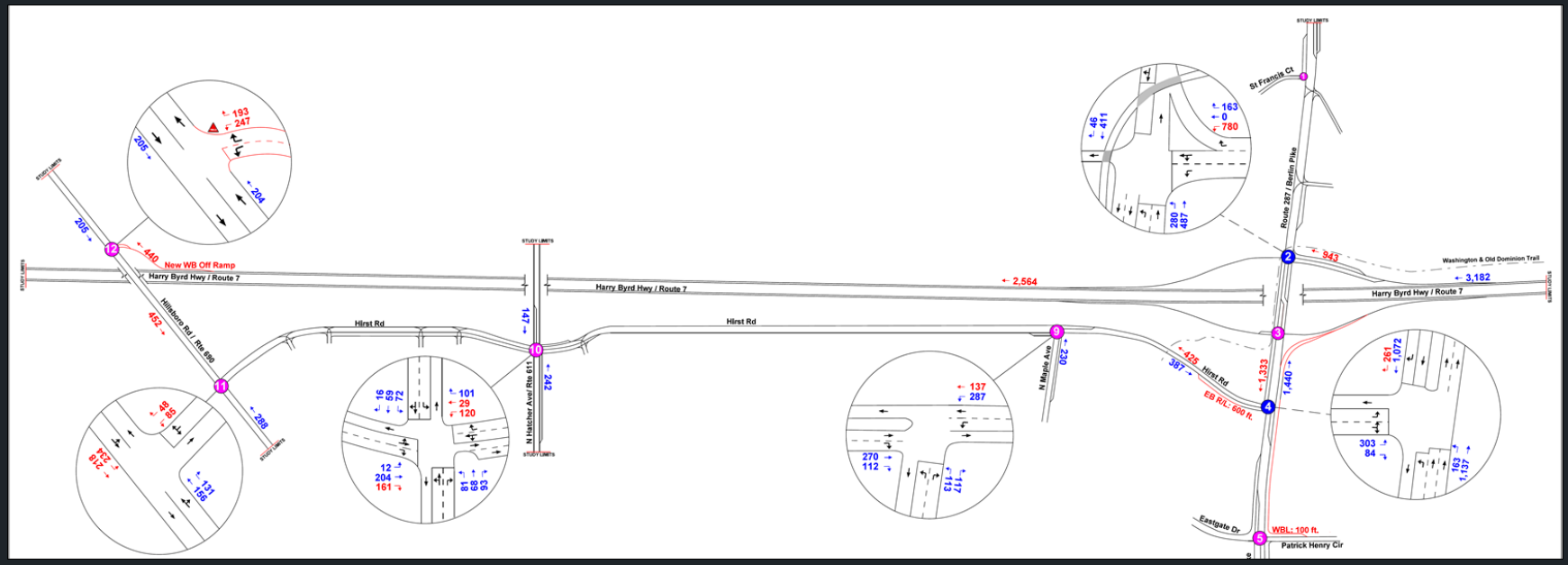
- All Rt 287 intersections are at overall LOS C or better and average queues are within storage

In PM Peak, Rt 7 Bypass operates at LOS C or better except for the WB segment before the ramp, at LOS D

- Average queues at the off ramp are within storage
- On Rt 287 overall intersection LOS is C or better except at the WB ramp at D. Queues and delays are greatly reduced by added NB lane

2020 IMPROVED WITH RAMP

A new Westbound Ramp from Rt 7 Bypass to Rt 690 was tested, with an expanded study area that included Hirst Rd from Rt 287 to Rt 690 with three existing intersections



RESULTS OF 2020 IMPROVED WITH RAMP NETWORK

- Improvements still needed on Hirst Rd EB approach at Rt 287
- The proposed Rt 690 WB off-ramp improves PM peak operations along Hirst Rd west of Rt 287
- If the ramp is not built, operation can be improved along Hirst Rd by signalizing the intersection of Hirst Rd/Hatcher Ave
- Improvements along Rt 287 and at Rt 7 interchange are needed regardless of a new Rt 690 off-ramp

SUMMARY OF FINDING

- Currently, capacity issues are causing delays and queues on Rt 287 and on the ramps from Rt 7 Bypass which will worsen over time
- For 2014 adding capacity to the WB ramp and Rt 287 eliminates most problems
- Preliminary investigation showed Rt 287 capacity additions along with signal timing can improve conditions over 2014 Baseline as an interim measure without adding ramp capacity.

SUMMARY OF FINDING (CONTINUED)

- By 2020, additional capacity changes are needed for Rt 287 and at Hirst Rd along with the 2014 changes
- A WB only ramp at Rt 690 is of limited value to operations on Rt 287, but helps Hirst Rd. Other improvements can also mitigate Hirst Rd problems

QUESTIONS & COMMENTS